the Imperial University at Tokyo. His works include not only a memoir of 400 pages on the motions of the earth's atmosphere, but also an important paper on the movement of water in the soil, as affected by pressure, evaporation, capillarity, etc. This latter is undoubtedly the most extensive theoretical memoir ever yet published on the subject, and is accompanied by tables based on experiments, so that Kitao's results are applicable to all kinds of soils. As Kitao perfected his education in Germany, and was for a long time a pupil of Helmholtz, his scientific papers have been written in the German language and published among the memoirs of the university. It is very desirable that they should be reprinted and made easily accessible to scholars thruout the world. As such reprinting is done very cheaply in Japan, it is to be hoped that many will subscribe for early copies of the complete work.

Meteorologists will be especially pleased to learn that a reprint of all the works of Prof. William von Bezold has been undertaken by a German firm, and copies can be obtained thru any importer. As this reprint will include many memoirs additional to those contained in the Editor's "Mechanics of the Earth's Atmosphere", it should come into the hands of every student of the physics of the atmosphere.

American students frequently inquire for the memoirs published by Prof. William Ferrel. Some of these were reprinted in 1882 as Professional Paper No. 8 of the Signal Service. His popular essays form Professional Paper No. 12, and his "Temperature of the Atmosphere" was printed in 1884 as Professional Paper No. 13. His paper entitled "Recent Advances" was an appendix to the Annual Report of the Chief Signal Officer for 1885, and his papers on the reduction of the barometer to sea level and on the psychrometric formula were appendices to the Annual Report of the Chief Signal Officer for 1886. But these are only a small part of his works on meteorology; three most important contributions were published by the Coast Survey and others in scientific journals. It would give a great stimulus to the study of our science if all these could be reprinted in a style as handsome as that adopted by the Carnegie Institution in reprinting the works of Doctor Hill. Written by the founder of modern dynamic meteorology, even tho Ferrel's works be eventually superseded, yet they will always be classics and in great demand, and will reflect credit on America. But an expensive edition is to be avoided, as his writings should be made accessible to every student.

The editor has fortunately been able to preserve an excellent set of notes on a series of lectures delivered by Ferrel in 1885–6 to the higher officials of the Signal Service. These notes are a simple presentation of some of the more prominent points in meteorology that interested him, and are apparently worth elaborating and publishing in the style so often adopted by German students as tributes to the merits of eminent professors.—*C. A.*

PREMATURE PUBLICATION.

Investigators, busy in the search after new facts or laws in nature, have very different habits as to the publication of their results, depending, of course, upon their respective personal characters and experiences. Some, for instance, rush into print at every opportunity and keep the scientific world stirred up with the frequent announcement of interesting results, suggested possibilities, or half-proven novelties. Others are more circumspect, and are so reluctant to publish that which may be criticized or annulled by some fellow student along the same line of work, that the world very rarely hears from them. Euler published a thousand papers, but Helmholtz scarcely a hundred of a technical character. Now it is true that the thousands of authors and the tens of thousands of papers that are treasured in the history of science have not all of them been of the first class. Most of them may be said to be now utterly forgotten, and yet each did some little good; and there is no reason to regret that the world has had such men and has read their works. Each honest man studies, experiments, talks, writes, and teaches in the hope that he may accomplish something worth while, and each must be encouraged to do his best. The multiplicity of journals and societies may embarrass the bibliographer and overwhelm the reader who would keep up with the progress of knowledge, but it is better that authors should write and publishers print, rather than that nothing be done, as tho the world had gone to sleep. There must be a beginning, and the progress of knowledge will always relegate the poorest papers to obscurity. One valued correspondent, recently withdrawing an excellent paper that he had prepared for publication, writes:

> It is a poor plan to publish uncertainties and thereby perhaps befog the truth for years, as has happened ofttimes heretofore. Now the matter of the earth's radiation to space involves so many doubtful quantities that I believe the less a man commits himself in print until some more experiments are made, the better he will like it hereafter.

We fully agree with our correspondent that the action of the earth's atmosphere on the radiation that comes to us from the sun, and on that which goes from us outward into space, is a matter that still needs elucidation, and we shall be very glad to print whatever he has to say on the subject No man can write on this better than he, and his errors, if any, will not befog, but clear away the fogs of error. On the other hand the subject has so many different aspects that one man can scarcely compass them all, and we therefore hope that other eminent physicists, with all the resources of modern laboratories, will take up some aspects of atmospheric and terrestrial radiation, since it is a fundamental problem of meteorology. In a general way we understand that Langley, Abbot, and others have been able to demonstrate that the moist atmosphere exerts both a general absorption of all solar rays, and a special absorption of specific wave lengths. We may summarize this by saying that as to general absorption by the air all the shortest waves are wholly absorbed, the visual waves are partly absorbed, and the longer waves are slightly absorbed, except in the regions of special total absorption by water vapor, ammonia, carbonic acid, and other vapors, which regions, however, grow more and more extensive and profound as the wave length increases. We presume that by analogy we may also infer that the long wave radiation from the earth's surface is well-nigh extinguished by its absorption by the water vapor of the atmosphere, so that the radiation to space from the earth as a planet takes place almost wholly from the upper strata of its water-bearing atmosphere.

The preceding paragraph seems to be almost equivalent to the following statement by Abbot, who says that the idea that the earth's atmosphere is transparent to long wave lengths—

> Is certainly contrary to fact, as shown by the bolographs of the solar spectrum, which exhibit no energy to speak of in the water vapor bands; and also by the work of Rubens and Aschkinas, who show that much less water vapor than is present in the atmosphere is enough to completely absorb nearly all the range of wave lengths which the earth emits. This strong absorption of the earth's radiation must keep its surface warmer and more uniform in temperature than it would be otherwise, for the water equivalent of the atmosphere is not inconsiderable, and it must take some time to warm it by the absorption of the earth's radiation, and any covering that checks the escape of the heat must augment the temperature of what it covers. Hence I do not agree that the "outcome is the same in a general way", and I feel sure that the atmosphere is not transparent to long wave lengths.

These statements harmonize in a general way with most of the thermal phenomena; and yet they are but broad generalities when contrasted with all that we wish to know about terrestrial radiation. Much greater precision must be given to our ideas before we shall be able to explain or predict the formation of frost, cloud, hail, and the phenomena of storms from a mechanical point of view. The thermal phenomena of the atmosphere can be elucidated only by combined experi-

mental and mathematical work. They belong to the domain of mathematical physics. It is scarcely creditable to the laboratories and graduate students of American universities that many of them do not devote themselves to the study of problems in physics that have such important applications to meteorology. We believe that both the Astrophysical Observatory of the Smithsonian Institution and the Solar Physics Observatory of the Carnegie Institution, on Mount Wilson, will do much to elucidate our problems, but the field is broad enough for many other coworkers, some of whom must seek for stations in the thinnest, driest, clearest air that is attainable anywhere on the globe.—*C. A.*

SONORA STORMS AND SONORA CLOUDS OF CALIFORNIA.

By ARCHIBALD CAMPBELL. Dated Campo, Cal., September 17, 1906.

As to the "sonoras," or sonora clouds, as they are generally called on the Pacific coast (see fig. 1), I can only explain them thus: They were, I believe, so named by the old Spanish or Indian settlers of the high Sierras of Lower California, who from their elevated positions, 5000 to 7000 feet above sea level, looking across the narrow Gulf of California, could see these masses of clouds form, seemingly in the state of Sonora, Mexico, and rising as if from the plains of Sonora, in a few hours drench them with floods of rain.

FIG. 1.—Sonora cloud.

The belt on which these storms fall is from twenty to forty miles in width, east to west, and the length from north to south in Lower California is 450 miles, and in the United States 120 miles, mostly in San Diego County, but a small part in Riverside County, California, extending over the Laguna, Cuyamaca, and Palomar mountain ranges, southeast to northwest, ending at the north end of the Palomar Mountains, in Riverside County, and in the high backbone of the mountain range between the Imperial Desert and the coast. The conditions go no farther west than the 2000-foot elevation of this latter mountain chain, the backbone and source of all our San Diego County rivers. If we in southern California had the naming of the Sonoras, looking at them from our more northerly mountain tops, we might have called them the Arizonas, as to us they seemingly rise there. Very seldom does this cloud formation extend into the low belt of the coast, nor to the east into the desert, but occasionally, to the surprise of the inhabitants there, it does take a daring sweep out of its usual confines and give them a waking up from their sleep with lightning, thunder, and rain. The oval area covered by the sonoras is about the wettest spot on the Pacific coast, with sometimes an annual rainfall of fifty to sixty inches at Cuyamaca and Laguna. Here at Campo the United States Signal Officer caught and measured one of the downfalls, recording 16.10 inches of rainfall in August, 1890, in a few hours of one day. Some call these rains the tail end of the tropical showers. The first indications we have of the periodical coming of these storms in early July are low, white, flat banks of clouds in the southeast, which in a day or two form into castellated clouds and break into thunder, lightning, and rain. Often till near noon the sky is clear of clouds, then perhaps in an hour or so the sky is clouded all over with tremendous masses of solid-caverned thunderheads, which break in a short time into tremendous volumes of rain and

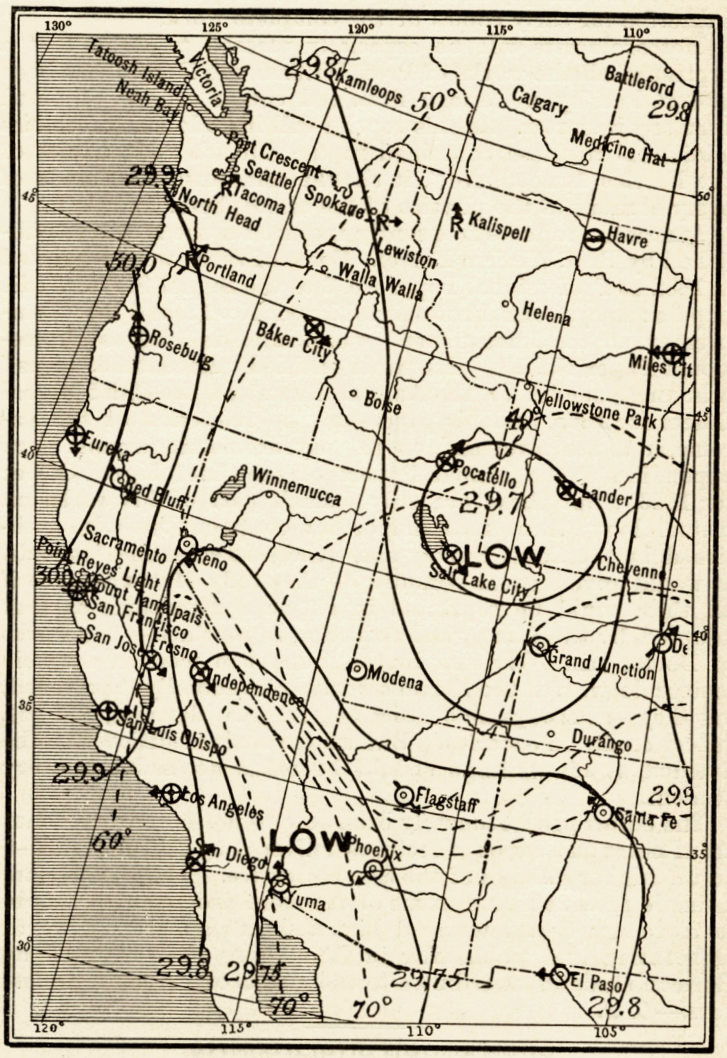

FIG. 2.—Weather map showing conditions which usually prevail during Sonora cloud period.

often destructive hailstorms. Sometimes for weeks at a time the whole belt, over 500 miles long, experiences unceasing thunder and lightning, and rain in partial areas. Sometimes these storms make a complete circuit of the horizon, commencing in the east and southeast with massive clouds, snow-white to dark gray, with tremendous up-sweeping clouds; then comes a rapid cannonade of thunder, with the most brilliant lightning ever seen; then the clouds rapidly move from their first base to south, southwest, and west, and so on in rapid succession till they make a complete circuit; but now and again they break off like a meteor into space and take a rapid straight course to the west or northwest toward the coast, so that for fifty to sixty miles one can follow them by the ever